

D1 cont. 2. (amended) The method of claim 61, wherein the NOx in the exhaust gas is reduced nearly stoichiometrically with respect to the reductants by as much as 80-90%.

3. (amended) The method of claim 61, wherein the NOx in the exhaust gas is selectively reduced by [as much as] at least about 99%.

64. The method of claim 61, wherein the NOx in the exhaust gas is reduced to a level in the range of about 10-200 ppm.

65. The method of claim 61, wherein NH₃ and HNCO together are in the range of about 0.5-2.0 molar ratio with respect to the NOx in the exhaust gas. COPY/DUPLICATE

66. The method of claim 61, wherein the autocatalytic reactions are self-sustained in the autothermally heated exhaust gas even when a portion of the heat released is recovered by heat transfer surfaces.

67. The method of claim 61, wherein the heat release is equivalent to a uniform adiabatic increase of about 50-500°F in the exhaust gas temperature.

2. 4. (amended) The method of claim 61, wherein the [exhaust gas is heated] autothermal heating and autocatalytic NOx reduction are completed within about 0.02-1.5 seconds [to a final temperature].

69. The method of claim 61, wherein the CO is oxidized below a residual concentration of about 2000 ppm.

70. The method of claim 61, wherein the CO is oxidized below a residual concentration of about 500 ppm. COPY/DUPLICATE

71. The method of claim 61, wherein the residual concentration of NH₃ is maintained at a level below about 20 ppm.

72. The method of claim 61, wherein the residual CO concentration is depleted below about 50 ppm and the residual NH₃ is depleted below about 2 ppm.

D3 13. (amended) The method of claim 61, wherein the hydrocarbon(s) are at least one member selected from the group consisting of natural gas, liquefied petroleum gas, alcohols, gasoline, diesel fuel, aviation turbine fuel, oxygenated hydrocarbons, hydrocarbon amines, methane, propane, methanol and ethanol[, either as liquids or vapors].

74. The method of claim 61, wherein the hydrocarbon(s) are introduced throughout a cross-section or around a perimeter of the exhaust gas flowpath using one or more nozzles. COPY/DUPLICATE

75. The method of claim 61, wherein the hydrocarbon(s) are introduced as liquid drops with diameters in the range of about 20-500 microns.

76. The method of claim 61, wherein the hydrocarbon(s) are introduced in the exhaust gas using a carrier gas selected from the group consisting of steam, compressed air, pressurized exhaust gas, or ammonia.

77. The method of claim 61, ~~COPY/ DUPLICATE~~ further comprising the steps of measuring a final temperature at one or more locations throughout the cross-section of the exhaust gas flowpath and controlling the amount of introduced hydrocarbon(s) to maintain the measured temperature(s) at a level in the range of about 1400-1550°F.

78. The method of claim 77, further comprising the step of measuring a final CO concentration at one or more locations throughout the cross-section of the exhaust gas flowpath downstream from the temperature measurement(s).

~~1979~~ (amended) The method of claim [1,] ~~78~~ further comprising the step of using the final CO measurement(s) to [verify a level of CO depletion corresponding to the final temperature(s) for controlling] control the introduction of hydrocarbon(s).

~~200~~ (amended) The method of claim ~~61~~, further comprising the step of generating NH₃, HNCO or a combination thereof by vaporization, decomposition, or catalytic conversion of at least one reductant(s) selected from the group consisting of NH₃, HNCO, cyanuric acid, [or] a tautomer of cyanuric acid, urea, ammonium salts of organic acids, and hydrocarbon amines.

81. The method of claim 61, wherein the NH₃, HNCO or a combination thereof are generated prior to the introduction of hydrocarbon(s).

82. The method of claim 61, wherein the NH₃, HNCO or a combination thereof are generated after the introduction of hydrocarbon(s). ~~COPY/ DUPLICATE~~

83. The method of claim 61, wherein the NH₃, HNCO or a combination thereof are generated concurrently with the hydrocarbon(s).

84. The method of claim 61, further comprising the step of injecting reductant(s) directly into the exhaust gas to vaporize or decompose the reductant(s).

85. The method of claim 84, wherein the reductant(s) are injected prior to the introduction of hydrocarbon(s).

86. The method of claim 84, wherein the reductant(s) are injected after the introduction of hydrocarbon(s). ~~COPY/DUPLICATE~~ 24

D5 87. (amended) The method of claim 84, wherein the reductant(s) are injected concurrently with the introduced hydrocarbon(s), wherein the reductants are injected as mixtures, solutions, emulsions, slurries, or atomized gases.

88. (amended) The method of claim 84, wherein the reductant(s) comprise a concentrated aqueous solution [consisting of] containing NH_3 , urea or combinations thereof [in water containing] wherein the aqueous solution contains dissolved nitrogen in the range of about 15-30% by weight.

89. The method of claim 84, further comprising the steps of measuring baseline NOx levels in the exhaust gas with respect to an operating condition of combustion equipment that produces the exhaust gas and controlling the amount of reductant(s) injected to maintain a level of NOx reduction or a final NOx level in the exhaust gas throughout the operating range of the combustion equipment. ~~COPY/DUPLICATE~~

90. The method of claim 89, further comprising the step of monitoring an operating condition of the combustion equipment to provide a basis for estimating the baseline NOx emissions throughout the operating range of the combustion equipment, either continuously or periodically.

91. The method of claim 90, wherein the amount of injected reductant(s) is controlled to generate NH_3 and HNCO together at a level in the range of about 0.5-2.0 molar ratio with respect to the baseline NOx.

D6 92. (amended) The method of claim 84, further comprising the step of measuring a final NOx level at one or more locations throughout the cross-section of the exhaust gas flowpath downstream from the autothermal heating and using the temperature measurement(s) to control the introduction of hydrocarbon(s). 24

93. The method of claim 92, further comprising the step of using the final NOx level(s) to verify the effectiveness of selective NOx reduction corresponding to an amount of introduced NH_3 and HNCO or an amount of reductant(s) injected to generate NH_3 , HNCO or a combination thereof. ~~COPY/DUPLICATE~~

94. The method of claim 93, further comprising the step of controlling the amount of introduced NH_3 , HNCO or the amount of reductant(s) injected to maintain a final NO_x level in the exhaust gas.

95. The method of claim 61, further comprising the step of adjusting the temperature of the exhaust gas to a temperature in the range of about 900-1600°F before the introduction of hydrocarbon(s).

96. The method of claim 95, wherein the temperature of the exhaust gas is adjusted to a temperature in the range of about 1050-1600°F so that the exhaust gas is heated autothermally in 0.02-1.0 seconds to a final temperature in the range of about 1400-1550°F by a heat release equivalent to an adiabatic increase of about 50-350°F effective for enhancing the selectivity of autocatalytic NO_x reduction.

97. The method of claim 95, wherein the temperature of the exhaust gas is adjusted to a temperature in the range of about 1200-1600°F so that the exhaust gas is heated autothermally in 0.02-0.5 seconds to a final temperature in the range of about 1400-1550°F by a heat release equivalent to an adiabatic increase of about 50-200°F effective for enhancing the selectivity of autocatalytic NO_x reduction.

D7 388 (amended) 98. The method of claim 61, further comprising the step of combusting a fuel to preheat the exhaust gas [in] to the temperature range of about 900-1350°F.

99. The method of claim 98, wherein the fuel is combusted directly in the exhaust gas.

100. The method of claim 61, wherein the introduced hydrocarbon(s) are mixed substantially uniformly and the autothermal heating results in an appearance of a visible chemiluminescence.

101. The method of claim 61, further comprising the step of recovering heat from the autothermally heated exhaust gas using heat transfer surfaces between the exhaust gas and the heat recovery fluid.

106. The method of claim 61, wherein the exhaust gas is generated by a previous noncatalytic method for selectively reducing NO_x .